EXHIBIT 1

International Fuel Cells
A United Technologies Company

Invention Disclosure

Invention Disclosure Project No: C0269/

Disclosure Title: "Sacrificial Anode" Start-Up And Shutdown Procedure

Date Conceived: [redacted]

Job No. (to which Inventor's time was charged when invention was conceived): 751500.2701

Date of first sketch: [redacted]	Drawing No. (if applicable):	Date of first successful test:	Job No. used for first successful test:

Identify Printed Materials Related to this Disclosure: FCM25107, M. Perry and C. Reiser, 12/99, Express Final Report

First disclosure of this invention prior to preparation of this Invention Disclosure was made to the following:

1) Name 1:	Employee (< click)	Date:
2) Name 2:	Employee (< click)	Date:
3) Name 3:	Employee (< click)	Date:

Nature and date of first public disclosure of this invention:

To whom/where:	Date:

The invention contributed to meeting the work statement requirements of Government/Customer Contract Number: (if any)

Specific product(s) to which invention may apply:

Product 1: PC33
Product 2: PC34
Product 3: PC35
Product 4: PC36
Product 5:

Specific development to date:

Planned future development:

First product sold (or offer of sale) incorporating this invention:	Date of first sale (or offer) incorporating this invention:

Inventor Name(s): *(Full Name, Ex: Doe, John R.)*	Telephone Extension:	Mail Stop
1) Balliet, Ryan J.	2073	601-09
2)		
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Invention Description: (3 Parts)

Define the Problem:
On start-up of a fuel cell, fuel is normally applied to the anode, replacing either air or Nitrogen This results in the corrosion of the Carbon in the cathode catalyst, significantly increasing Oxygen mass transfer resistance with each cycle. The situation is similar on shutdown. Fuel is normally purged out of the anode with either Nitrogen or air, and this causes Carbon corrosion at the cathode.

Problem Solution:
The strategy is to let Carbon corrosion occur, but at the anode rather than the cathode. Because Hydrogen diffuses far more rapidly than Oxygen, and because generally there is a much higher concentration of Hydrogen on the anode than there is Oxygen at the cathode, the same amount of Carbon corrosion at the anode will produce far less cell performance loss per cycle. As a result, the number of start-stop cycles that can be completed before a given amount of performance is lost will be greatly increased.

Figure 1 shows a fuel cell system equipped to execute the "sacrificial anode" start-stop procedure. Table 1 is a state diagram that spells out the procedure. The following is a verbal description of the process:

START-UP
Fuel is first introduced to the Cathode (it is during this state that the anode is damaged). Fuel is then introduced to the anode. Once the anode has received fuel, air is introduced to the cathode and a load can be applied to the cell.

SHUTDOWN
On shutdown the cathode is first purged with Hydrogen. Air is then introduced to the anode. Once the anode has been purged with air, the cathode is also purged with air (it is during this state that the anode is damaged) and the shutdown is complete.

Both of these processes take advantage of the fact that an electrode is protected from carbon corrosion during a transition between air and fuel ~~if~~ the opposite electrode ~~contains fuel.~~ if it contains fuel on ©

Benefits of Invention over Prior Solutions:
-No Nitrogen required except for safety
-Quick start and stop
-No increased O2 mass transfer due to Carbon corrosion
-No developmental equipment required (eg VLD)
-No anode recycle blower required (but will work with system that uses recycle)
-Reformate and H2 compatible

These changes made after electronic submission of this disclosure. -R.B.

IFC Category: (click>) **Power Section**

Keywords: (Check all that apply)

Power Section	Fuel Processing	Systems/Controls	Other
☐ Membrane	☐ Reformer	☐ Thermal management	☐ Molten carbonate
☐ PEM	☐ Selective oxidizer	☐ Control	☐ Phosphoric Acid
☐ Ionomer	☐ CO	☐ Humidity	☐ Solid oxide
☐ Catalyst	☐ Carbon	☐ Reformate	☐ Base cell
☐ Catalyst support	☐ Gasoline	☐ Water management	
☐ Electrode	☐ Sulfur	☐ ERD	
☐ Cell	☐ Shift converter	☐ Deaerator	
☐ MEA	☐ Foam	☐ Pressurized	
☐ Diffusion Layer	☐ LTSC	☒ Start up	
☐ Bilayer	☐ Desulfurizer	☒ Shutdown	

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☐ Substrate	☐ Autothermal	☐ Enthalpy wheel	
☐ Flowfields	☐ Methanol	☐ Vehicle	
☐ Flow configurations	☐ Hydrocarbon	☐ HEX	
☐ Separator plate	☐ Oxygenates	☐ Air	
☐ WTP	☐ ATR	☐ Reactant	
☐ Coolers	☐ Poison	☒ CSA	
☐ Coolants	☐ Exhaust	☐ Preheater	
☐ Antifreeze	☐ Burner	☐ Saturator	
☐ Manifolds	☐ Scrubber		
☐ End plates	☐ Design		
☐ Non-repeat hardware	☐ Ammonia		
☐ Pressure plates	☐ Alumina		
☒ Corrosion	☐ Vaporizer		
☐ Seals	☐ Burner gas		
☐ Sealants	☐ Adiabatic		
☐ Freeze	☐ Carbon deposition		
☒ Shutdown	☐ Mixer		
☒ Start up	☐ Partial oxidation		
☐ Potential control	☐ CPOX		
☐ Performance	☐ POX		
☒ Performance decay			
☐ Electrolyte			
☒ CSA			
☐ Stack			
☐ Edge Seal			
☐ Graphite			
☐ Fiber			
☐ Nafion			

Inventor(s):
(for printed copy)

Signature: [signature]	**Date:** [redacted]
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Explained to and understood by:
(for printed copy)

Signature:	**Date:** [redacted]
Signature:	**Date:** [redacted]

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INSERT FIGURES HERE

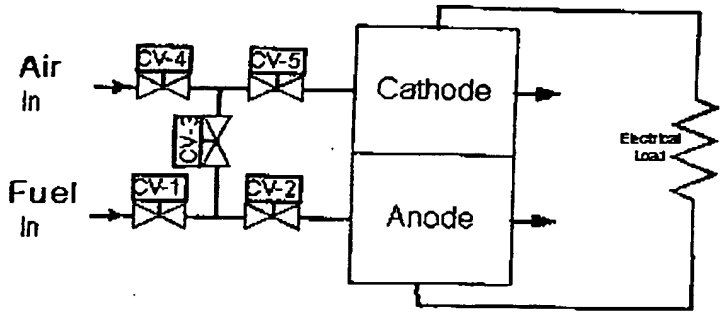

Figure 1: System equipped to perform "sacrificial anode" start/stop procedure

Table 1: Sample start-up procedure for FC system practicing "sacrificial anode" start/stop procedure

STATE	CV-1	CV-2	CV-3	CV-4	CV-5	Load	Anode Carbon Corrosion Occurring?	Cathode Carbon Corrosion Occurring?
Start-Up								
1	ON	OFF	ON	OFF	ON	OFF	YES	NO
2	ON	ON	OFF	OFF	OFF	OFF	NO	NO
3	ON	ON	OFF	ON	ON	OFF	NO	NO
Normal Operation								
4	ON	ON	OFF	ON	ON	ON	NO	NO
Shutdown								
5	ON	OFF	ON	OFF	ON	OFF	NO	NO
6	OFF	ON	ON	ON	OFF	OFF	NO	NO
7	OFF	OFF	OFF	ON	ON	OFF	YES	NO